



Heating the winter tunnel – is it worth it?

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Roots, Fruits and Shoots, LLC



- Johnstown, Ohio
- Started in Fall 2019
- I'm part-time at the farm, plus 2 seasonal staff and a few more for raspberry harvest
 - In winter, at farm 2-3 days/week (10-12hr/week)
- 2023: 3 acre rented, 2 acre in production, the rest in cover crop
- 3 high tunnels (7,000 sq ft)
- Fruit in the summer, veg in the winter
- Marketing – farmers market, winter CSA, some wholesale
- Live off-farm
- Organic and minimal/no-till practices
- Small, growing operation- \$60K in gross revenue in 2022

Winter growing in a tunnel

- Low cost/input
- Effective

BUT....

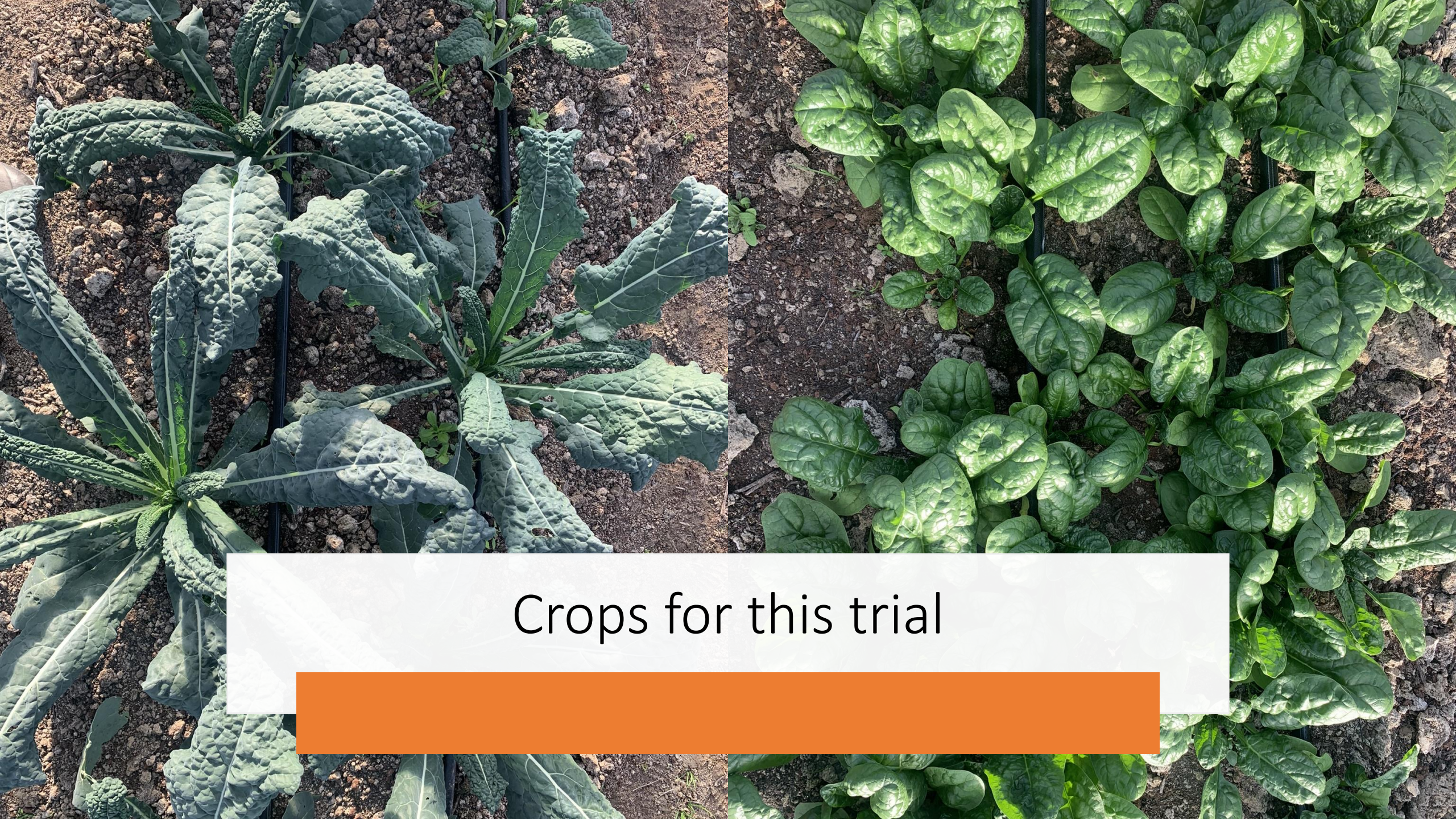
- Row cover babysitting
- Harvest window
- Unpredictable/no growth in Dec/Jan
- Fall turnover can be tricky



“The Costs and Benefits of Winter High Tunnel Supplemental Heat and Row Covering”

- SARE Farmer Rancher grant
- Evaluating using low level of supplemental heat with propane furnace compared to row covers to grow a couple different winter vegetables
- Timeframe: Aug 2021- Jan 2023
 - Two years repeating the same experiment





Crops for this trial

Year 1 (2021/2022) – Setup

- September– Bed prep in one tunnel 30x48' with propane heater
- September/October - Planted kale (TP-9/7) and spinach (DS-10/1)
- October – Installed two dividers in tunnel to make three different zones, set heater to turn on at 35 F
 - Unheated zone – temps close to other unheated tunnel, covered beds with row cover when forecast below 20 F
 - Middle zone – stayed a little warmer, stayed above 30 F
 - Heated zone – stayed above 35 F

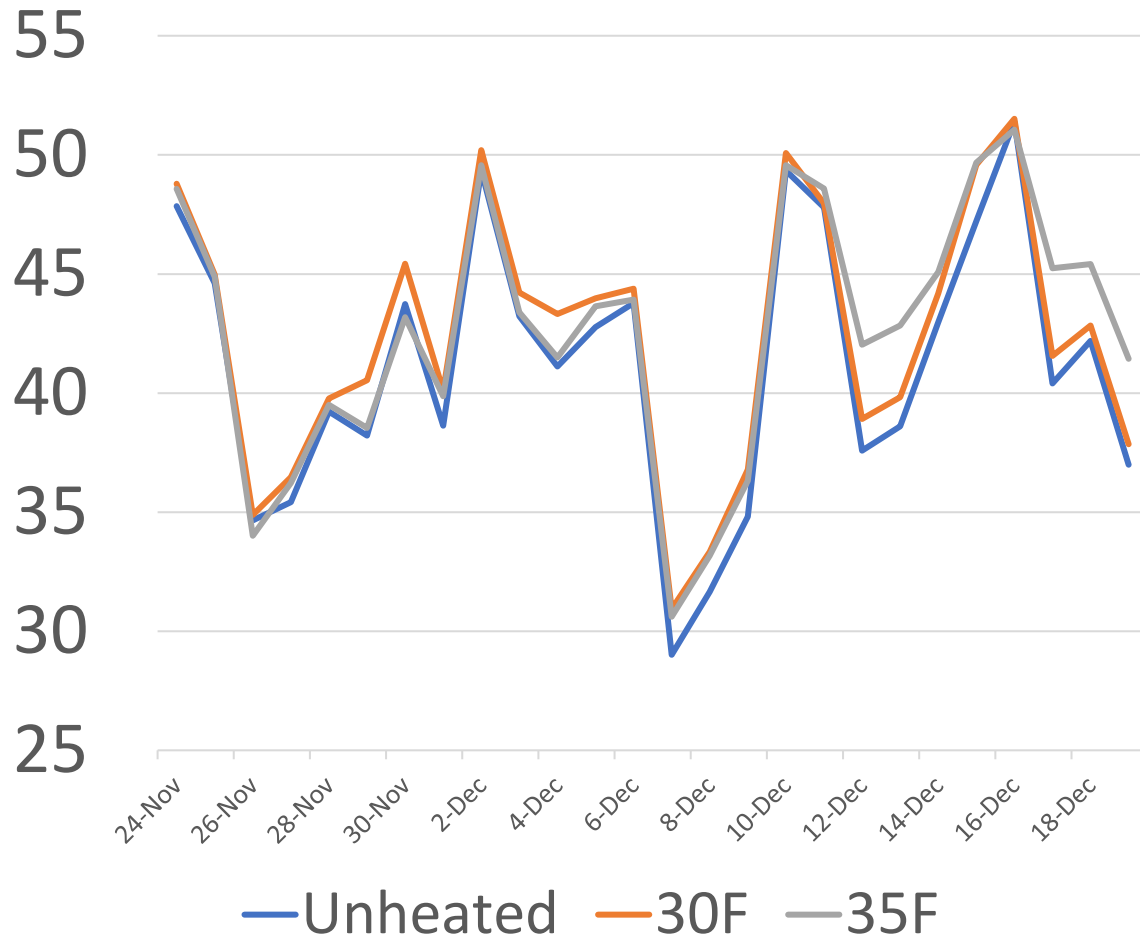


Info Collected

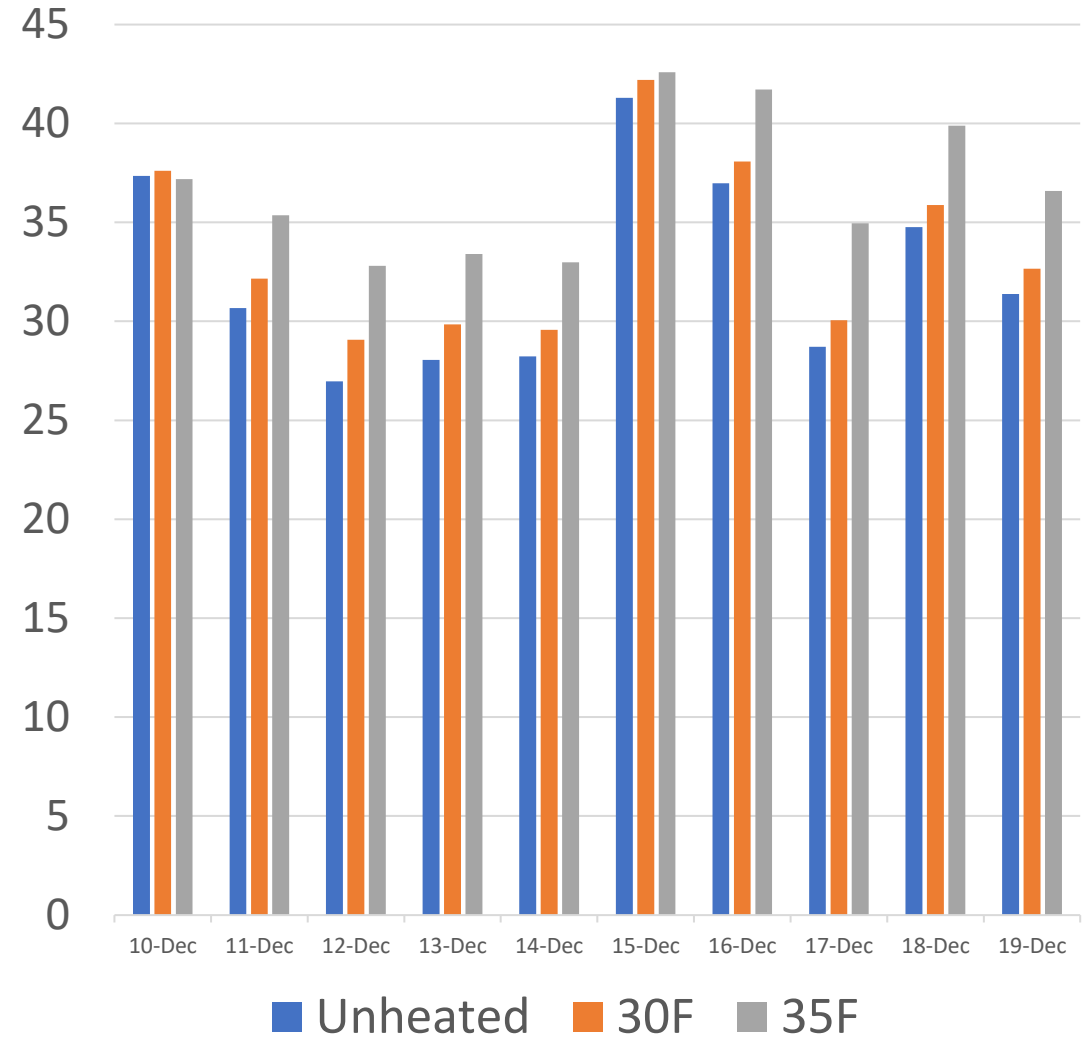
- Yield (in pounds and bunches) – from November – March
- Costs to run propane (fuel, electric)
- Labor cost to manage row cover, commute
- Material costs and propane setup costs



Treatment Average Temperatures



Minimum Temperatures

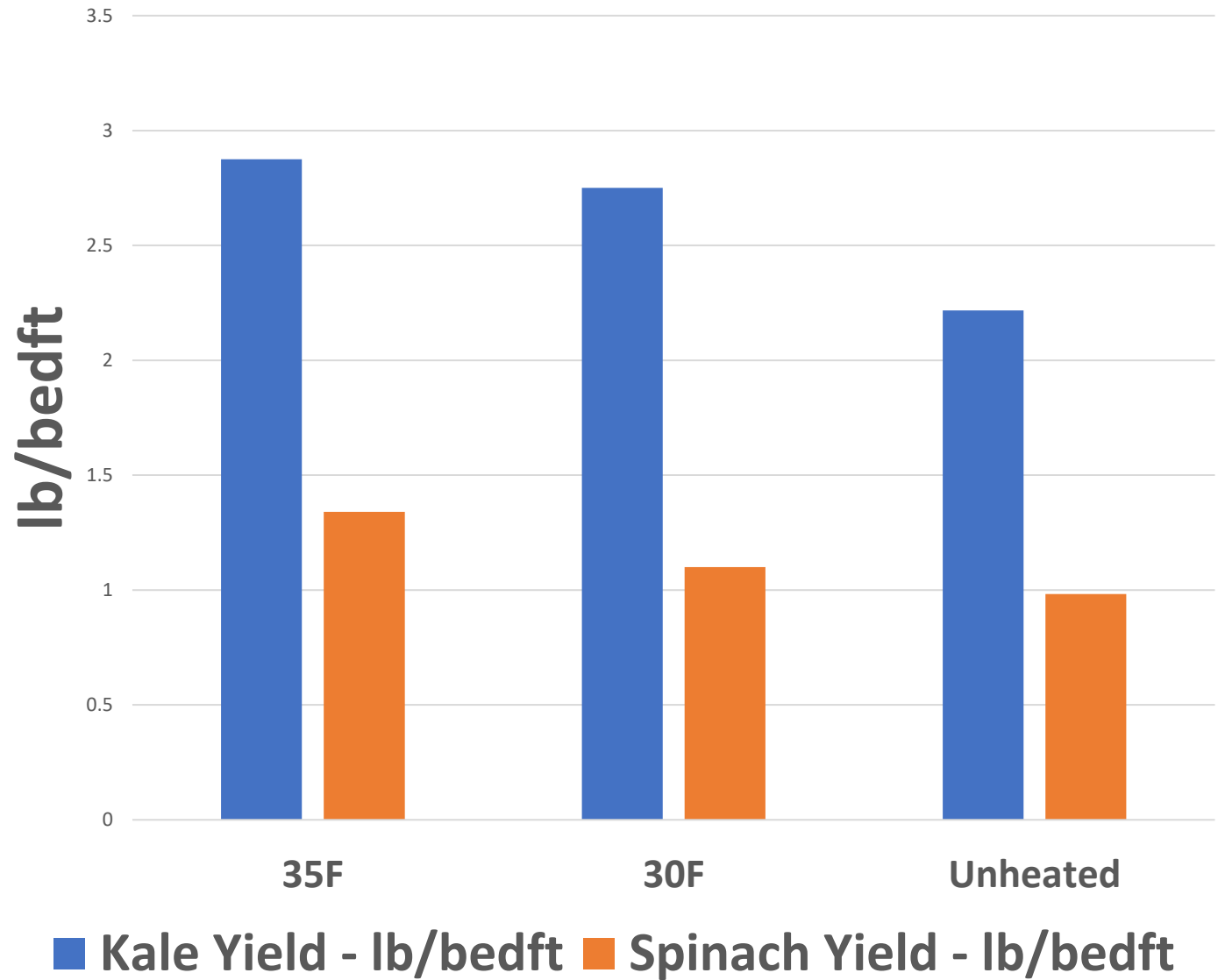


Year 1 - Challenges

- Salt buildup
- High pH
- High humidity because airflow blocked



Year 1 -
Yield





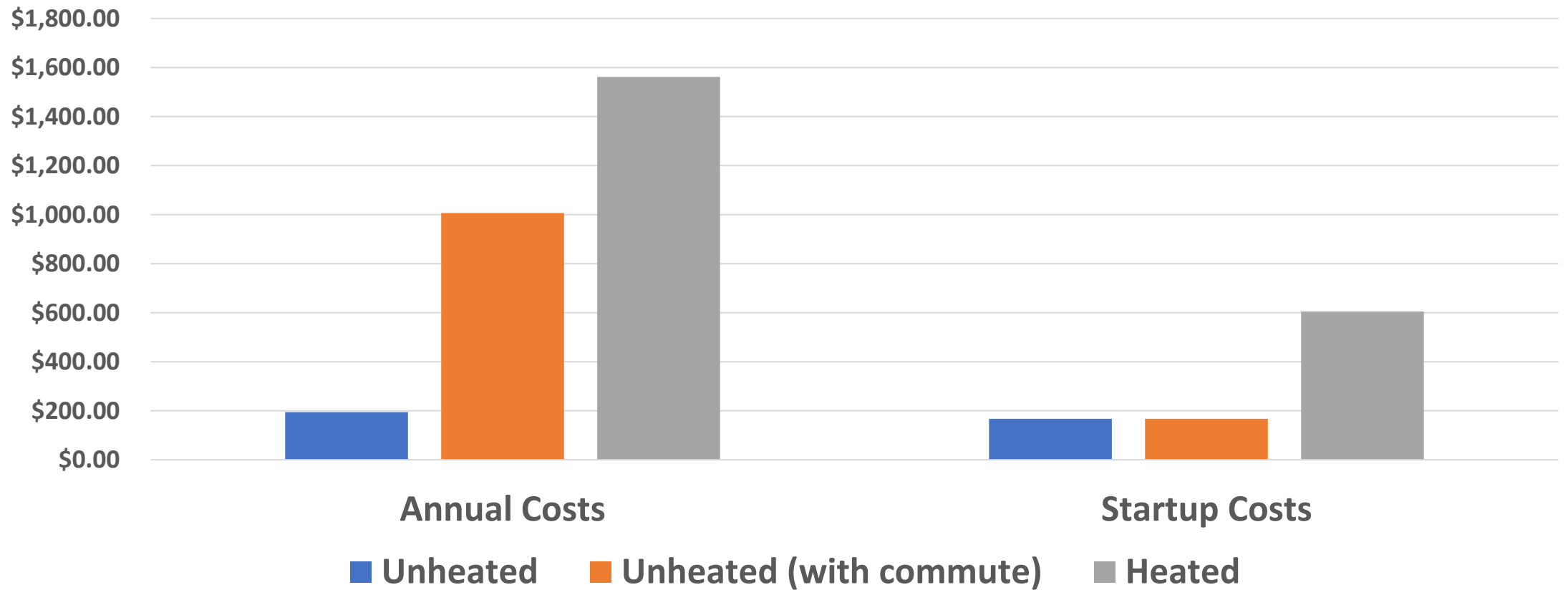
Lacinato Kale

- 30% greater yield for 35F than unheated
- 4.5% higher yield in 35F compared to 30F

Spinach

- 36% higher yield for 35 F than unheated
- 22% higher yield for 35F compared to 30F

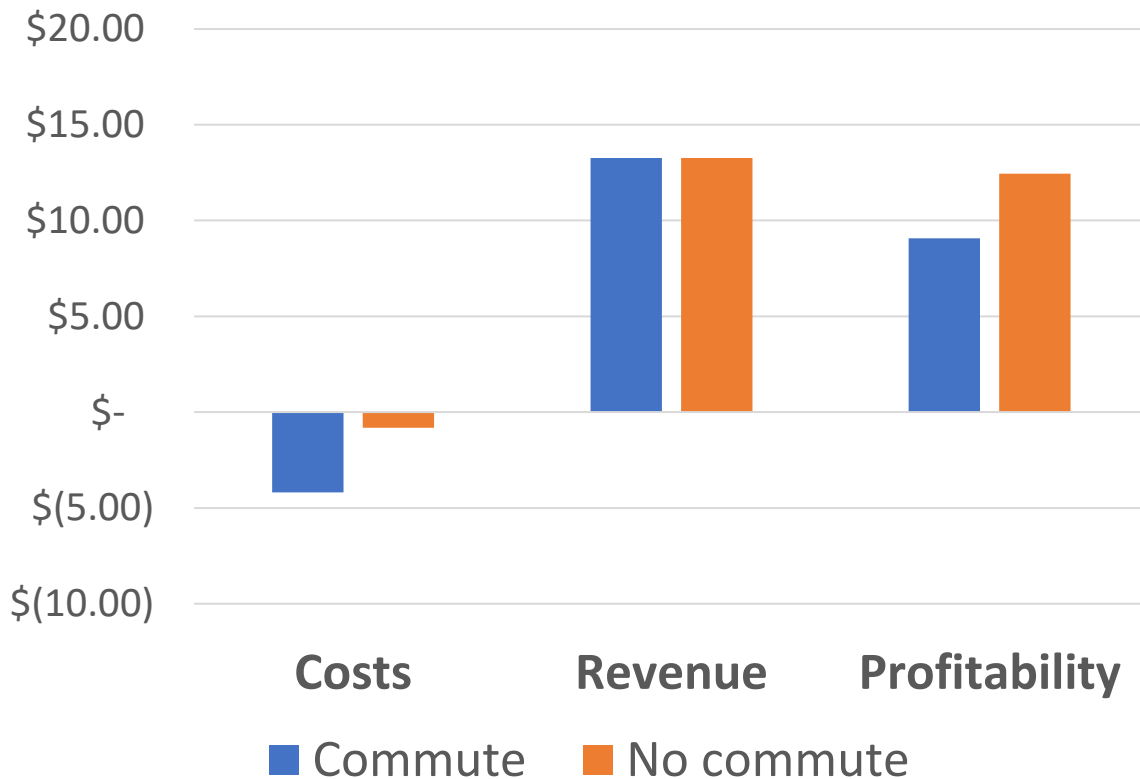
Year 1 - Costs



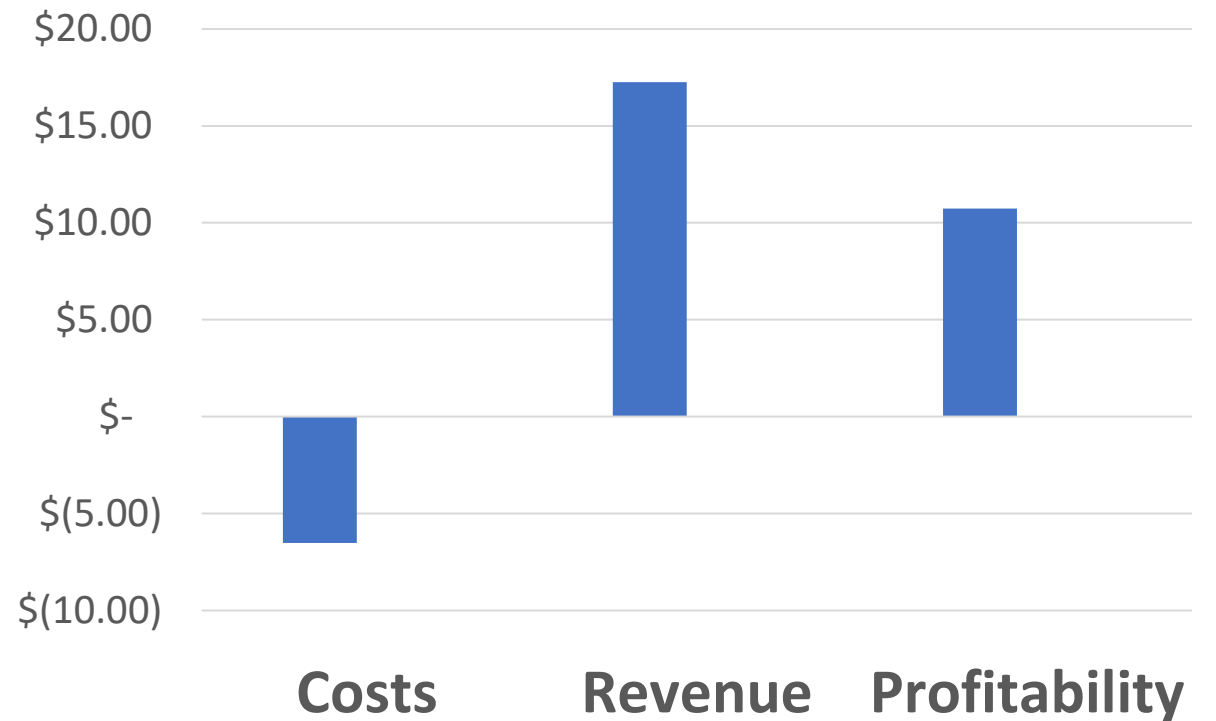
Year 1 – Kale Analysis (p

Yield increase needed to cover costs:
Commute – 0.39lb/bedft
No Commute – 0.95lb/bedft

Unheated Tunnel



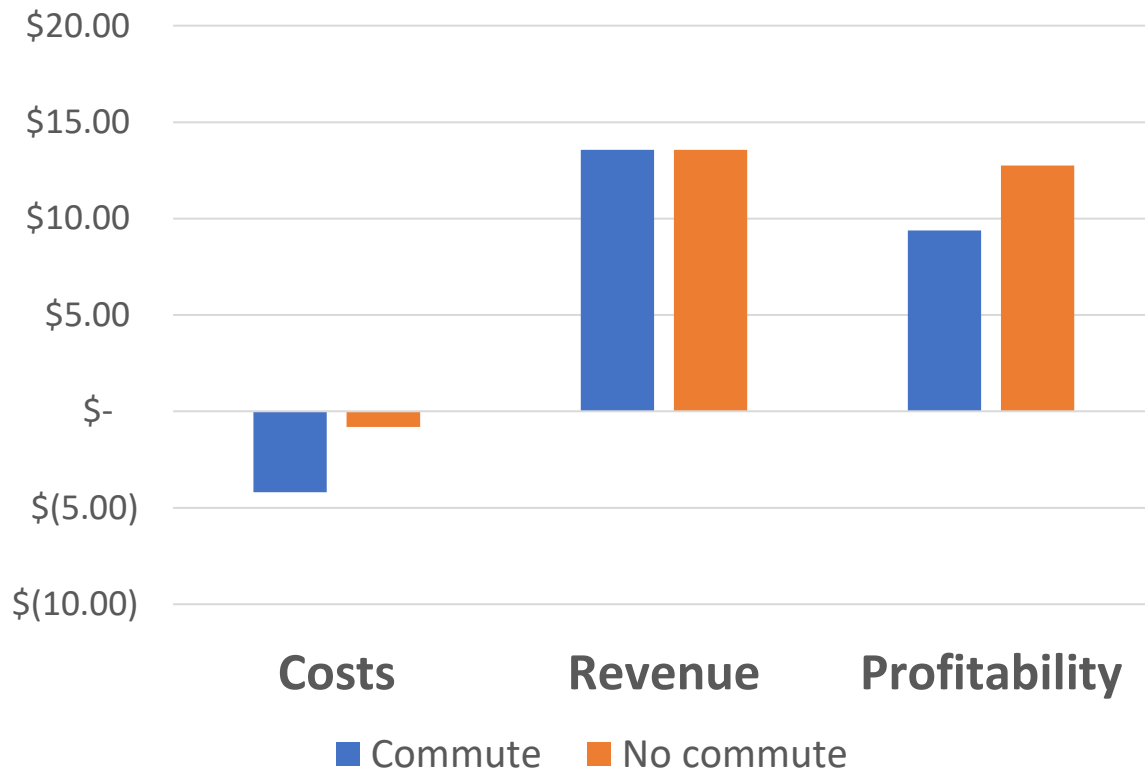
35F Heated Tunnel



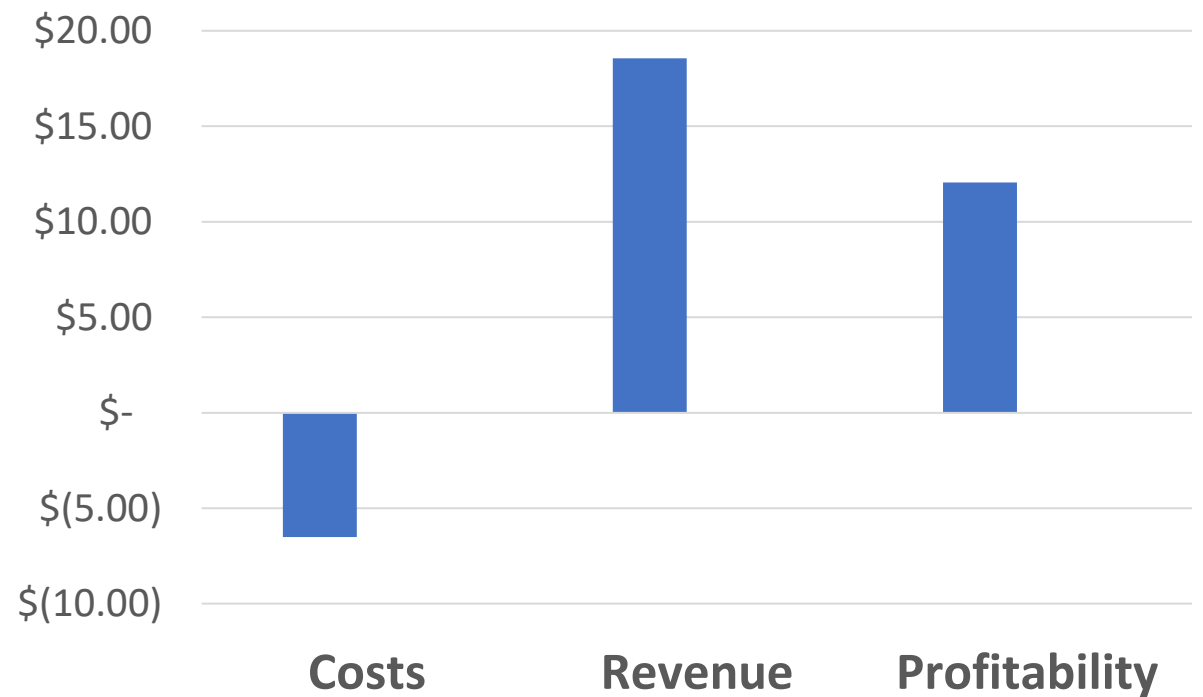
Year 1 – Spinach Analysis

Yield increase needed to cover costs:
Commute – 0.17lb/bedft
No Commute – 0.41lb/bedft

Unheated Tunnel



35F Heated Tunnel



Year 1 Takeaways

- Increased yield from heat covered costs incurred from running propane
- Heating was more profitable in my situation (living off-farm)
- Heating was not as profitable in situations without commute
- Yields were about 40% lower than previous years, would we get different results if we corrected soil prior to planting?

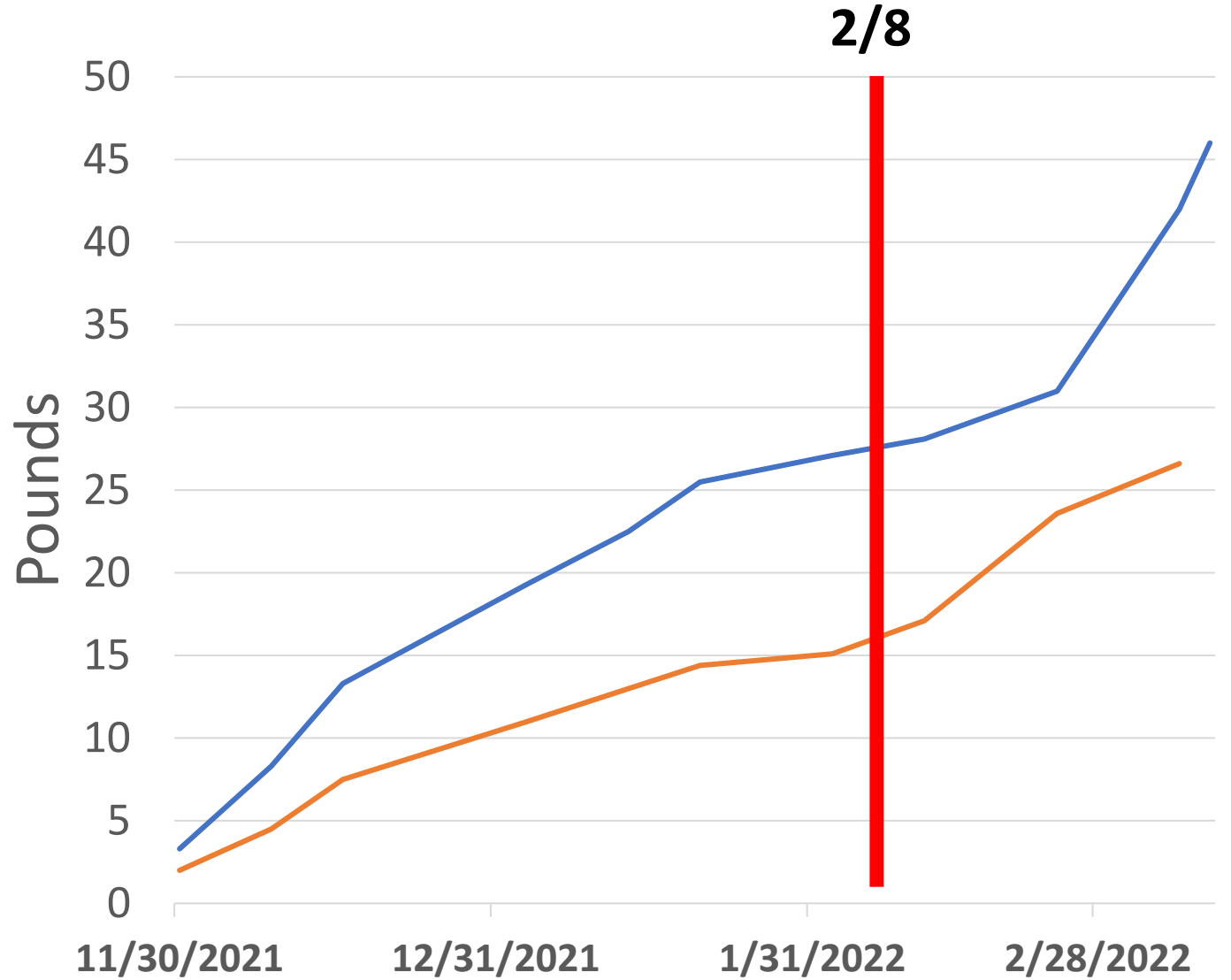


Year 2 Differences

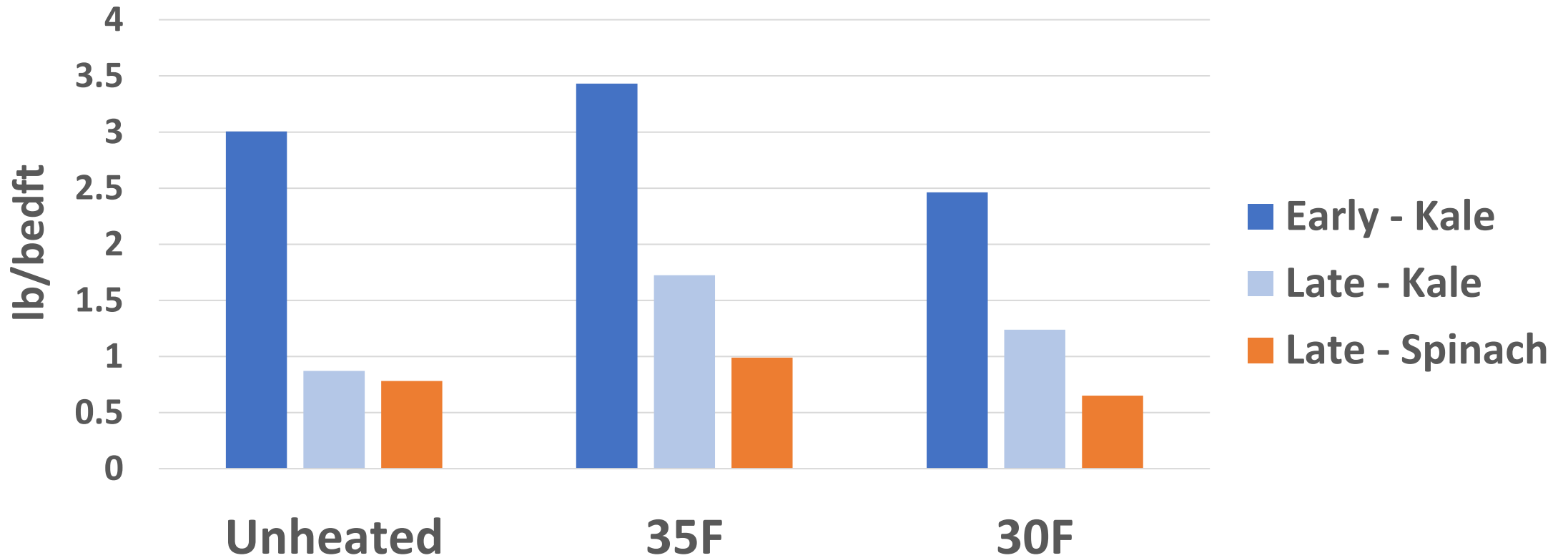
- Used three tunnels instead of one
- Two plantings for Kale* (9/7, 9/30)
- Beds amended and tested prior, pH and salt levels were within normal range (slightly high still)

**intended two spinach plantings but had poor germ in first planting, so just one in 9/30*

Spinach Yield Over Time

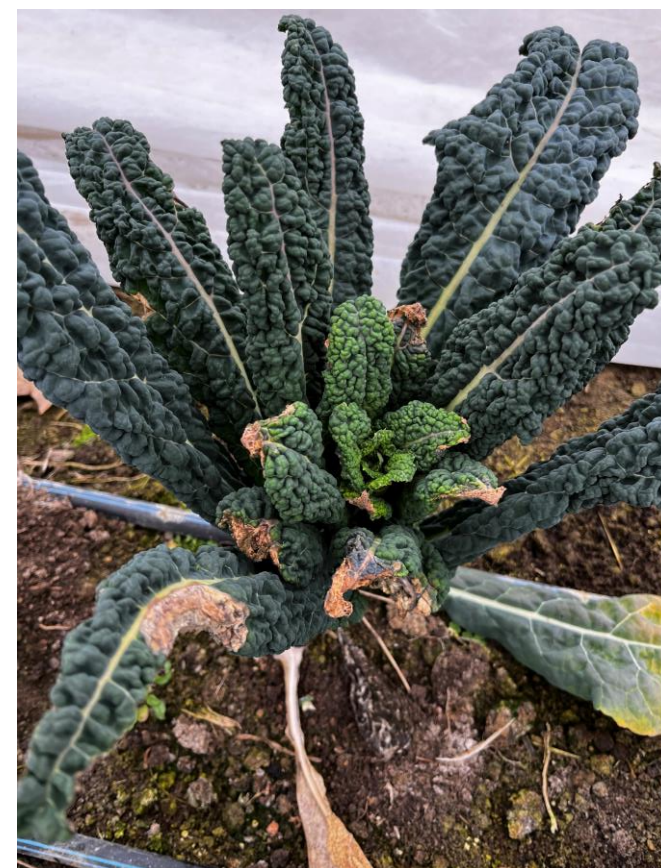


Year 2 – Yield*



*as of 2/8/23

State of the unheated crop

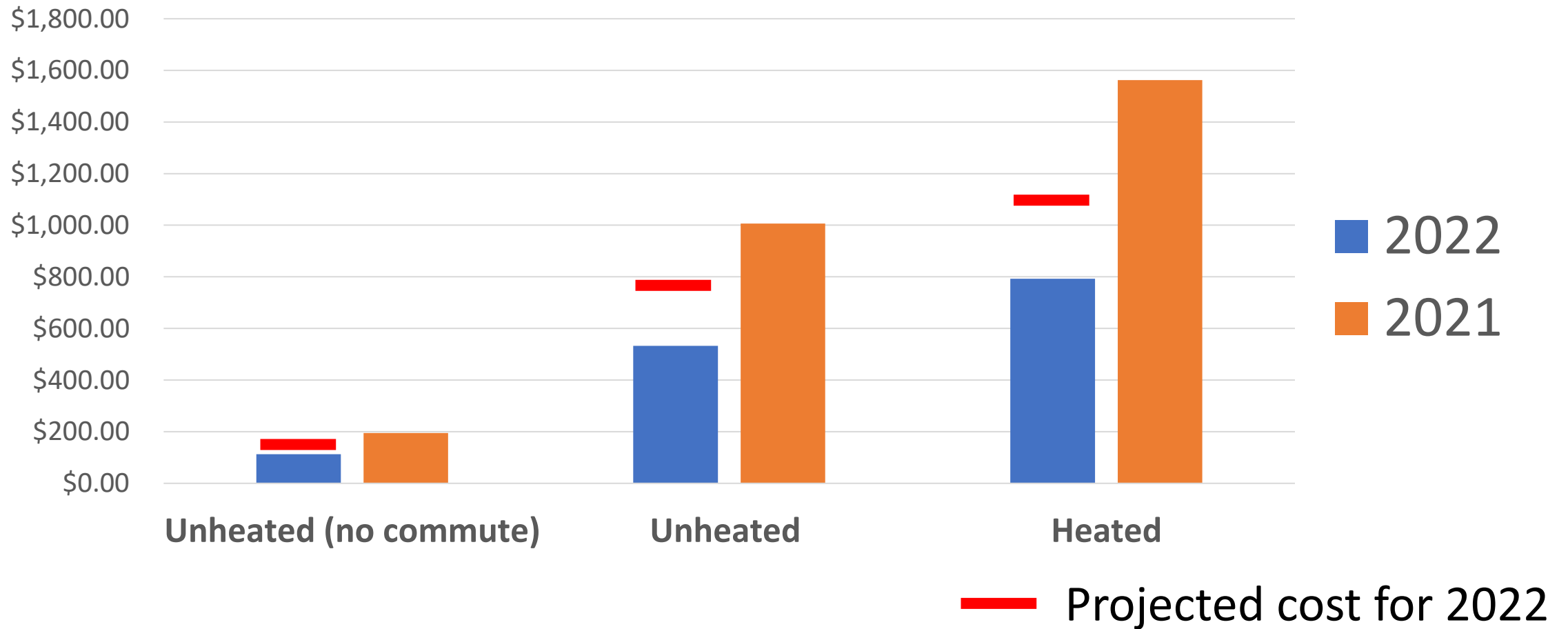


State of the heated crop





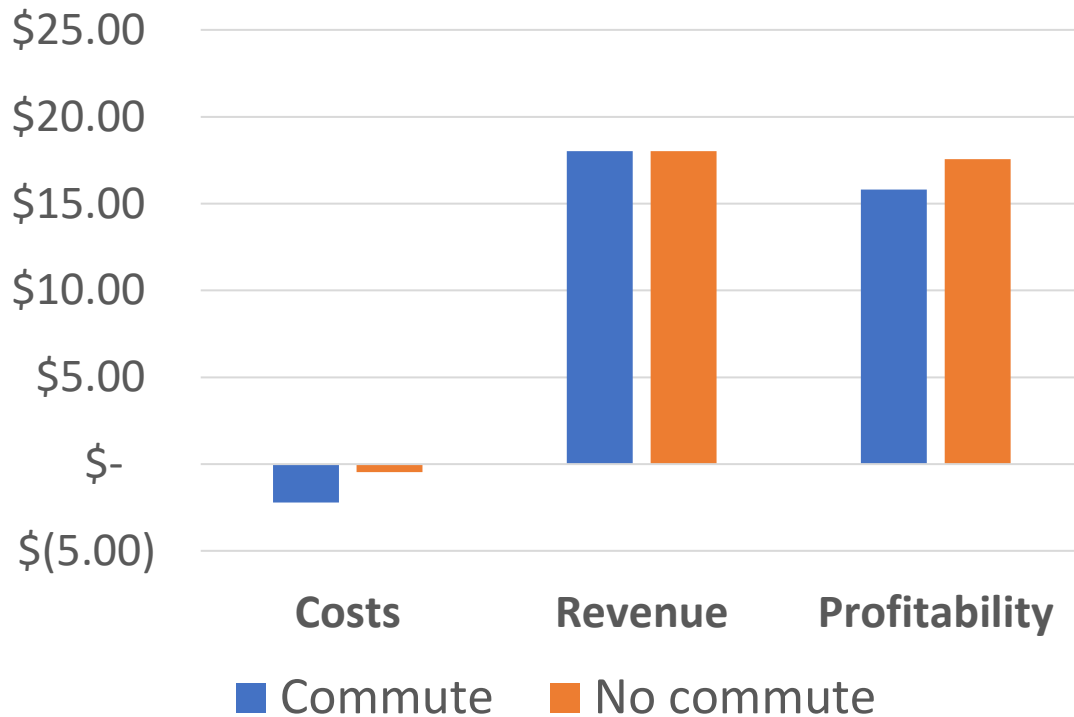
Year 2 - Costs



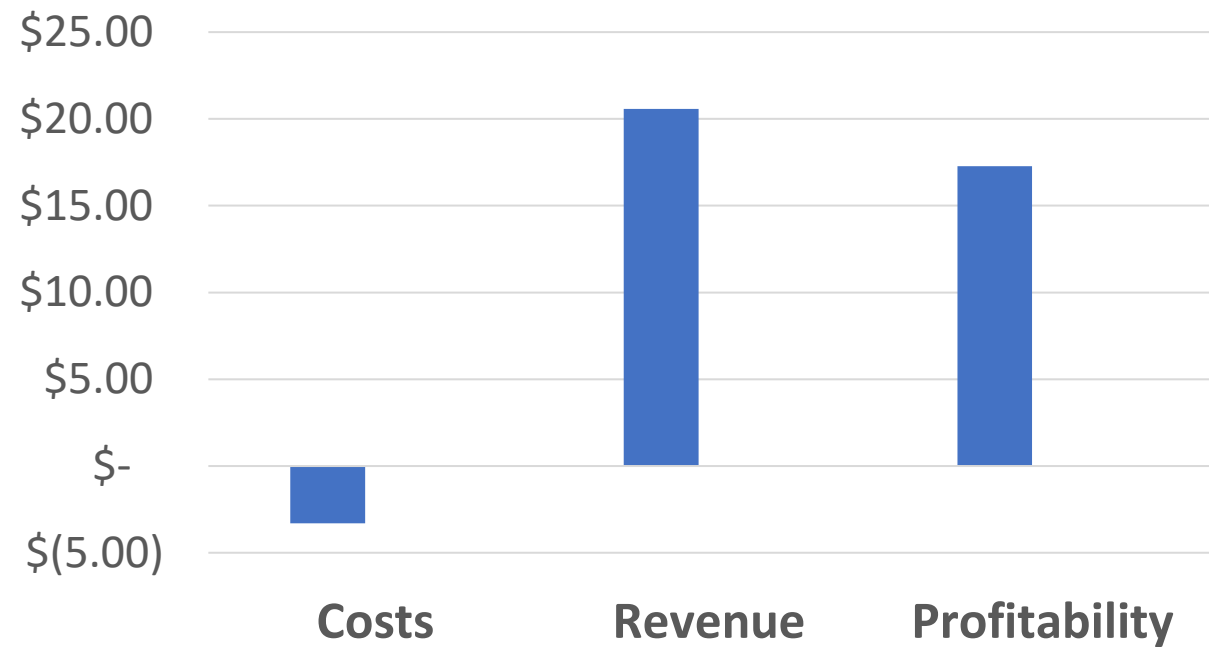
Year 2 – 9/7 Kale Analysis

Yield increase needed to cover costs:
Commute – 0.18lb/bedft
No Commute – 0.47lb/bedft

Unheated Tunnel

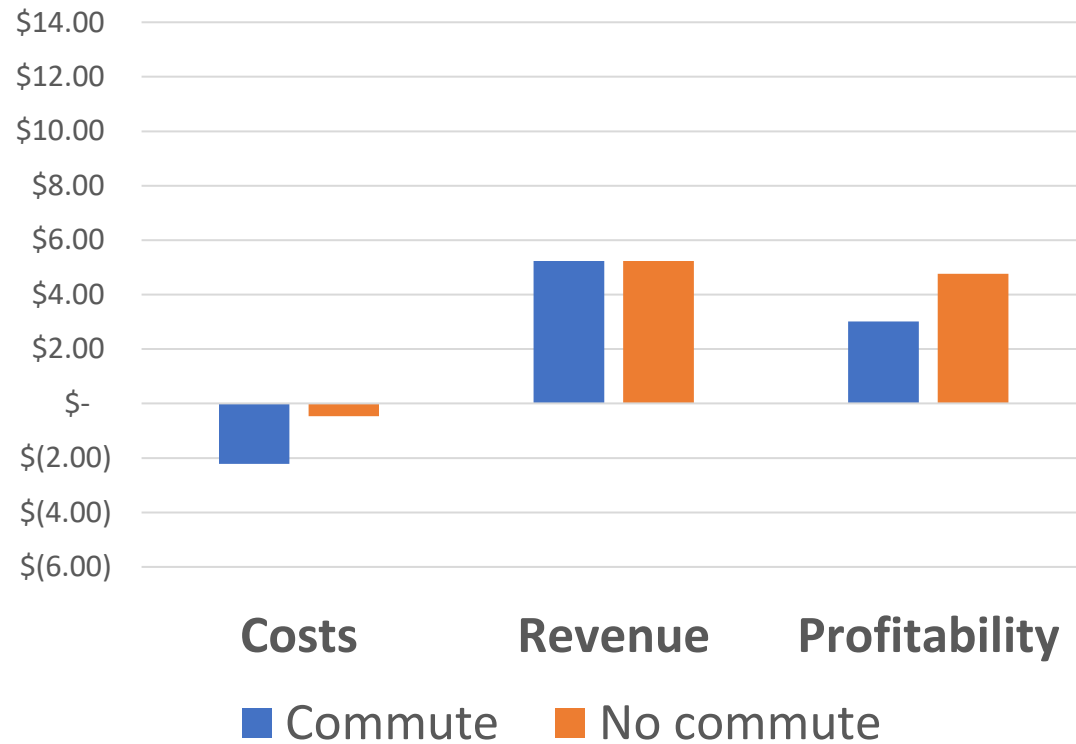


35F Heated Tunnel

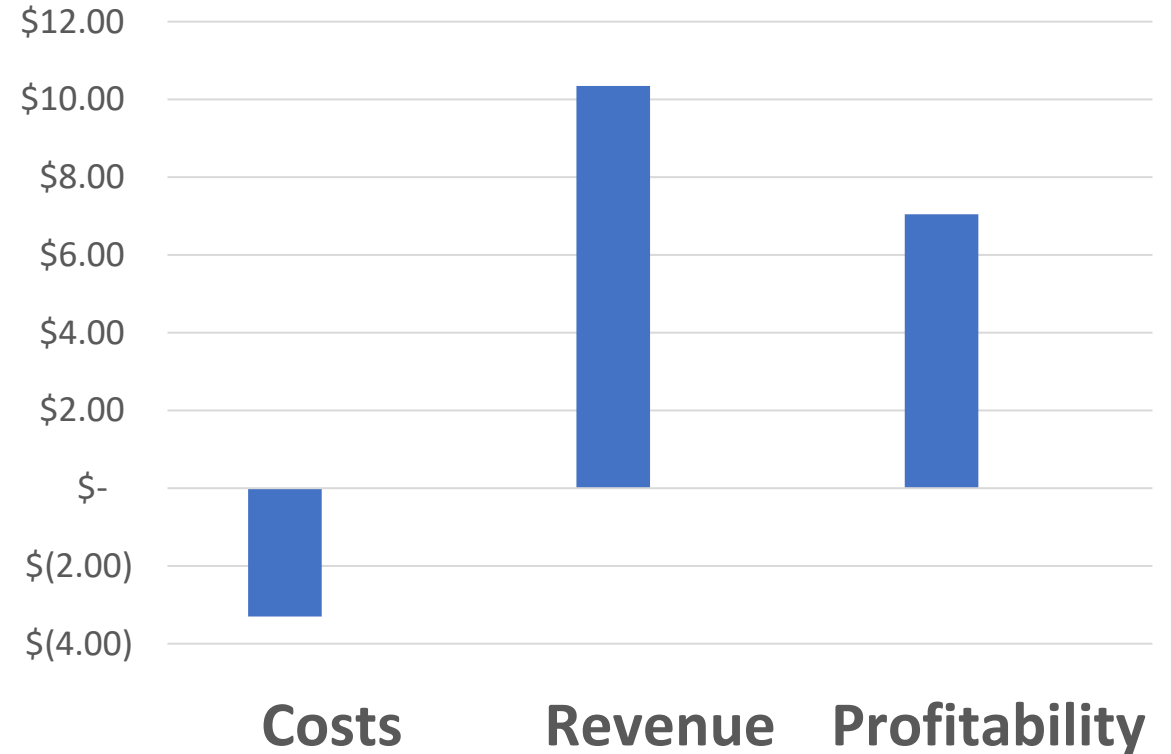


Year 2 – 9/24 Kale Analysis (per bedft)

Unheated Tunnel



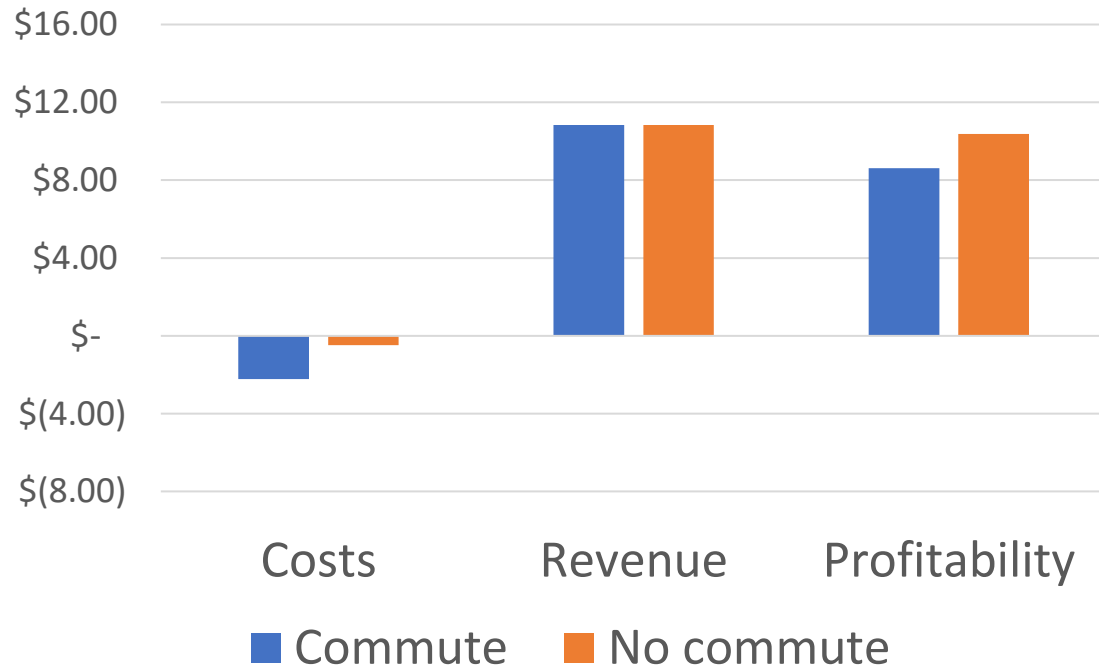
35F Heated Tunnel



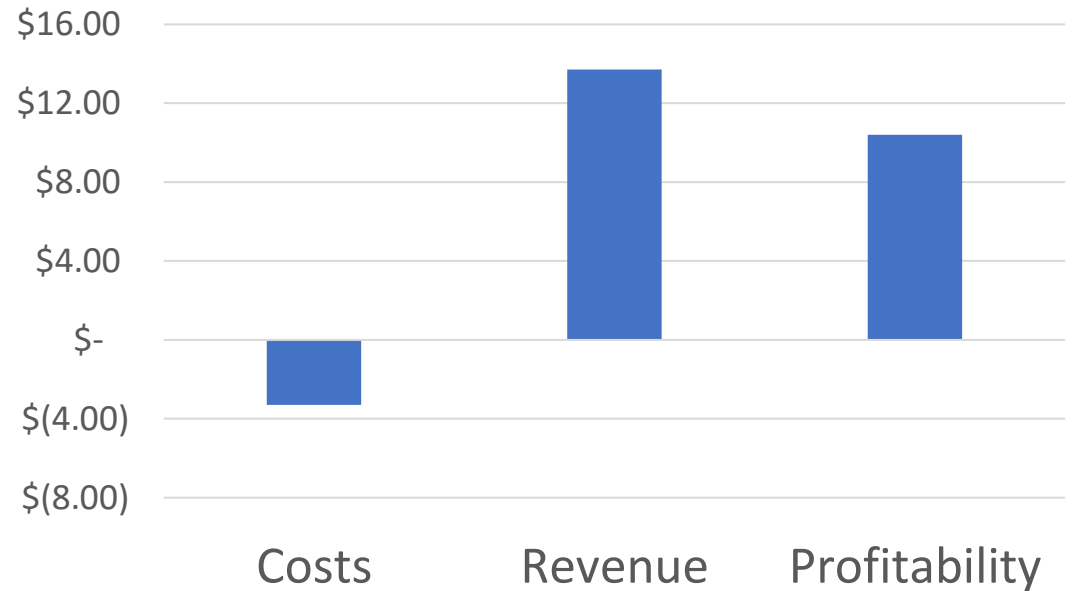
Year 2 – Spinach Analysis

Yield increase needed to cover costs:
Commute – 0.08lb/bedft
No Commute – 0.41lb/bedft

Unheated Tunnel



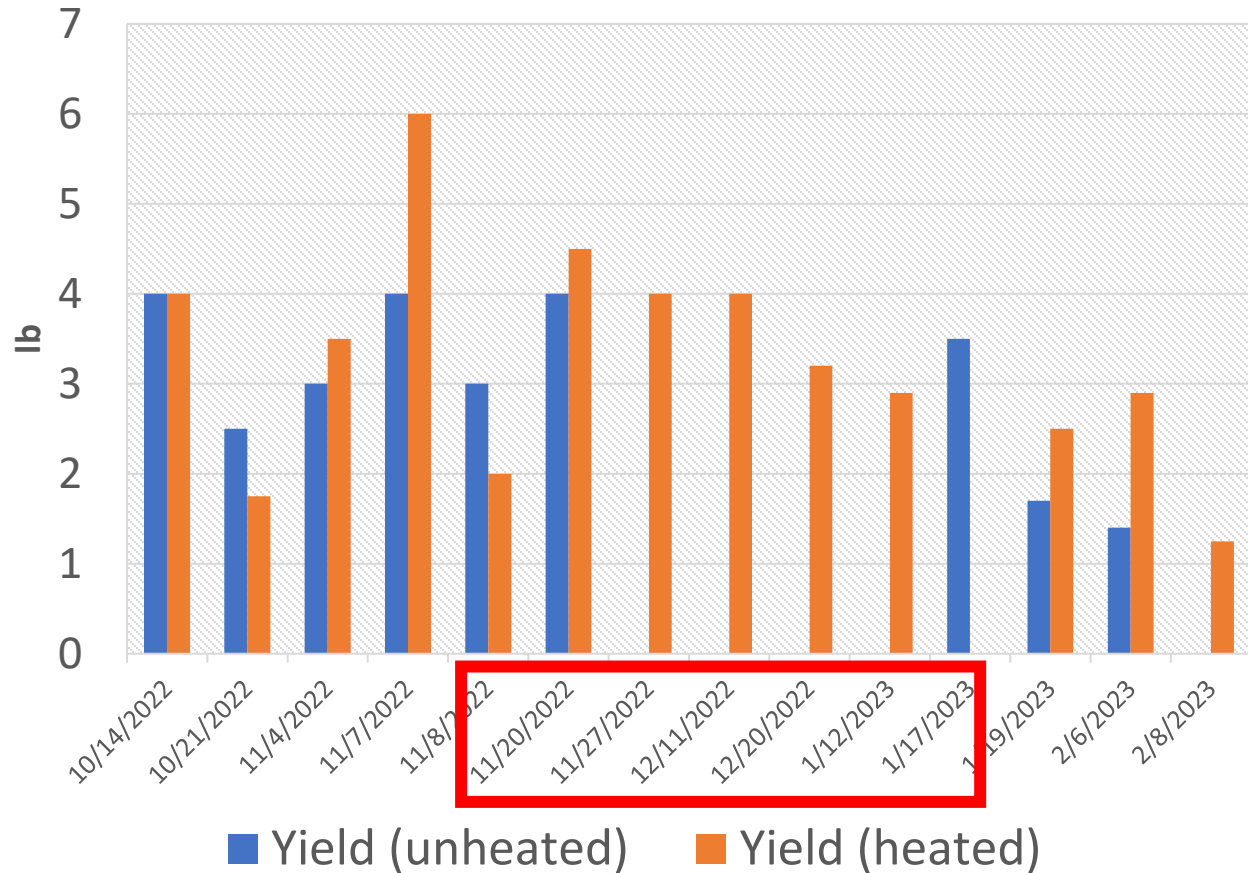
Heated Tunnel



Year 2 Takeaways

- Increased yield from heat covered costs incurred from running propane
- Heating was more profitable in my situation (living off-farm) for early and late plantings of crops
- Heating made late-planted kale profitable
- Heating was not as profitable for early season kale crop if not commuting (most of yield accumulated before Thanksgiving)
- Importance of sufficient fertilization

9/7 Kale Yield Over Time



Benefits of Heat

- More consistent, reliable harvest
- Harvesting at almost any time
- More comfortable harvests
- Your time isn't free - Fewer trips and unnecessary time spent at the farm



Other
observations





My plan going forward

- Continue to use propane heat for winter growing for most crops
- Plant earlier generally if using unheated space
- Evaluate effect of increased heat (40F)
- Evaluate with increased fertility
- Explore alternative energy sources for future farm on own land



Questions?

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